

# CONFINED SPACE ENTRY

PERMIT REQUIRED!



## CONFINED SPACE ENTRY

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# **C**ONTENTS

## **INTRODUCTION** **2**

## **PERMIT-REQUIRED CONFINED SPACES** **3**

Permit Space Hazards

## **THE PERMIT SPACE PROGRAM** **4**

## **THE CONFINED SPACE ENTRY PERMIT** **6**

General Information

Nature of Hazards in Confined Spaces

Preparation of the Permit Space

Atmospheric Testing

Equipment for Entry and Work

Emergency and Rescue Procedures

## **TRAINING AND DUTIES OF THE CONFINED SPACE ENTRY TEAM** **8**

Entry Supervisor

Attendant

Entrant

## **SUMMARY** **13**

## **QUIZ** **15**





# I NTRODUCTION

If you are one of the 1.6 million Americans who works in confined spaces each year, you know your job is dangerous. Serious injury or death in a confined space can be the result of asphyxiation, engulfment, electric shock, falls and heat stress. The Occupational Safety and Health Administration (OSHA) believes 85 percent of these accidents can be prevented if you learn about the hazards you face on your job.

## P ERMIT-REQUIRED CONFINED SPACES

A confined space has the following characteristics:

- Its size and shape allow a person to enter it.
- It has limited openings for workers to enter and exit.
- It is not designed for continuous occupancy.

A permit-required confined space has one or more of the following characteristics:

- Contains or has potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- Has an internal configuration such that the entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section
- Contains any other recognized serious safety or health hazard.

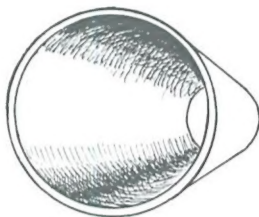
Some examples of confined spaces are reactor vessels, tanks, silos, boilers, sewers and pipelines.



TANK



SILO

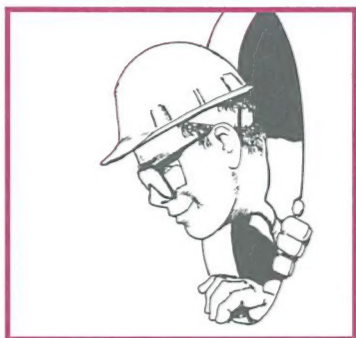


PIPELINE

## PERMIT SPACE HAZARDS

- Hazardous atmosphere:
  - The air might not have enough oxygen.
  - The air can be flammable or toxic.
  - Because of these hazards, **entry** is defined as placing any part of your body into the permit space.
- Engulfment—being trapped in liquid or solid material
- Danger from unexpected movement of machinery
- Electrocution
- Heat stress
- Becoming wedged into a narrow part of the space and suffocating
- Physical dangers such as falls, debris, slipping ladders.

Each of these hazards is more serious in a confined space, since rescuers can have a difficult time reaching you if you need help.



## THE PERMIT SPACE PROGRAM

Your employer will take these steps to help control the hazards of permit spaces:

- Identify all permit spaces in your workplace.
- Reduce employee risk around permit spaces with signs or training.
- Prevent unauthorized employee entry in permit spaces.
- Develop and implement a written permit space program.
- Document procedures establishing a non-permit space.
- Re-evaluate spaces when conditions change.
- Make special arrangements with contractors who may enter permit spaces.
- Supply safety and personal protective equipment.



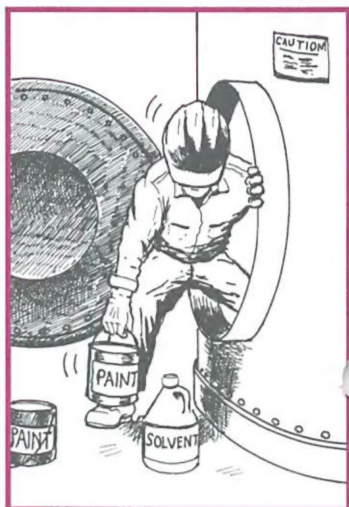
The work being done can cause conditions in a confined space to become more hazardous.

■ Hotwork uses up oxygen and can release hazardous materials. Any hotwork in a permit space requires special authorization and a Hotwork Permit.

■ Sanding, scraping and loosening residue can stir up hazardous materials.

■ Workers sometimes bring hazardous materials, such as solvents, into the permit space.

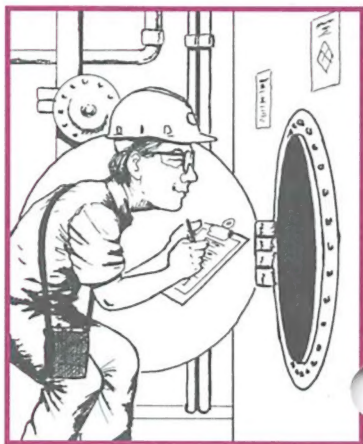
■ Work outside a permit space can produce harmful vapors that collect inside.



## THE CONFINED SPACE ENTRY PERMIT

The confined space entry permit tells what hazards are in the permit space and how to control them. It usually includes a checklist of necessary safety measures.

Before anyone enters the permit space, the entry supervisor goes through the permit to make sure all necessary hazard controls are in place and signs the permit. Re-evaluation of conditions by the entry supervisor is required at intervals and when a replacement entry supervisor takes over.



## GENERAL INFORMATION

Although permits vary in size, length and number of conditions covered, complete information is very important.

Permits should include:

- Specific permit space identification
- Purpose and date of entry
- Duration of authorization
- Authorized entrants by name
- Names of authorized attendant and entry supervisor
- Actual hazards of the identified space
- Control and isolation methods to be used
- Acceptable entry conditions
- Results of initial and periodic atmospheric testing
- Rescue and emergency services to be summoned
- Communication procedures authorized between attendant and entrants
- Equipment to be provided
- Other information as necessary
- Other permits, such as hotwork.

## NATURE OF HAZARDS IN CONFINED SPACE

This section lists the atmospheric hazards known to be present or potentially present. It includes atmospheric monitoring requirements and lists hazards to be controlled or eliminated to provide acceptable entry conditions.

## PREPARATION OF THE PERMIT SPACE

This section lists the steps required to prepare the space before anyone enters it. The entry supervisor checks to see that each required precaution has been taken.

- All departments likely to be affected by service interruption must be notified.

Post signs and put up barriers to protect entrants from vehicle traffic and pedestrians from falling into the space.





- Blind or disconnect and cap all input lines, so that no hazardous materials can enter the space.
- Make sure no hazardous energy can be released. Follow your company's lockout/tagout rules.
- Empty the space of any materials that may be hazardous. If necessary, clean, purge or inert hazardous residue in the space.
- When ventilation is needed, begin long enough in advance so that the air will be safe before anyone enters. Verify breathing safety by air testing.
- Assignment and training of entry supervisor, attendant and entrants is required to comply with the employer's Permit Space Entry Program and Emergency Response Plan.
- Attach completed Hotwork Permit, if required, to Confined Space Entry Permit.
- Add emergency contact telephone numbers.



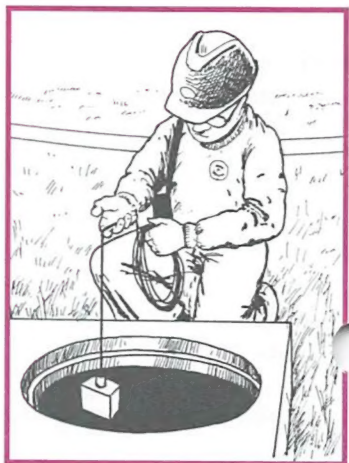
## ATMOSPHERIC TESTING

Test the air in all areas and levels of the space before entry. Monitor continuously or retest periodically for as long as the space is occupied and as is appropriate for the hazard involved.

For most items, allowable limits should be given on the permit. After tests are conducted, results are entered on the permit.

- First, test to make sure the oxygen content is between 19.5 and 23.5 percent.
- Test the concentration of flammable gases, which must be less than 10 percent of the lower flammable limit (LFL).
- Airborne combustible dust cannot meet or exceed its LFL.

**NOTE:** IF THE SPACE MUST BE ENTERED TO DETERMINE AIR QUALITY, THE TESTER IS REQUIRED TO WEAR RESPIRATORY PROTECTION.





■ **Toxicity:**

- List any toxic materials that could be present and their permissible exposure limits (PEL).
- Test to make sure none of these materials has a concentration greater than its PEL.

■ If the air is unsafe according to any of these tests, the hazard must be controlled before entry is allowed.

■ If the air becomes hazardous later on, the permit must be cancelled and everyone must leave the space.

■ Evaluate for heat stress potential.

- When testing is required, enter the degree reading according to the **Wet Bulb Globe Thermometer**. Note **F** for Fahrenheit or **C** for Centigrade.

■ The person performing the atmospheric tests signs or initials the permit after each test result.



## **EQUIPMENT REQUIRED FOR ENTRY AND WORK**

■ Appropriate personal protective equipment, such as hard hats, face shields and encapsulated suits must be made available at the site and listed.

■ Decide whether respirators and portable air monitors are required and which types match the hazard.

■ If continuous communication between the attendant and entrant will be difficult or impossible, choose and list devices, such as radio or video equipment. Test this equipment before entry. List any special procedures necessary, such as hand signals.



# CONFINED SPACE ENTRY PERMIT

## GENERAL INFORMATION

Permit No. \_\_\_\_\_

Space to be Entered: \_\_\_\_\_

Purpose of Entry: \_\_\_\_\_

Location/Building: \_\_\_\_\_

Authorized Duration of Permit: \_\_\_\_\_

Date: \_\_\_\_\_

to \_\_\_\_\_

Time: \_\_\_\_\_

to \_\_\_\_\_

## PERMIT SPACE HAZARDS (Indicate specific hazards with initials.)

☐ Oxygen deficiency (less than 19.5%)

☐ Oxygen enrichment (greater than 23.5%)

☐ Flammable gases or vapors (greater than 10% of LFL)

☐ Airborne combustible dust (meets or exceeds LFL)

☐ Toxic gases or vapors (greater than PEL)

☐ Mechanical hazards

☐ Electrical shock

☐ Materials harmful to skin

☐ Engulfment

☐ Other: \_\_\_\_\_

## EQUIPMENT REQUIRED FOR ENTRY AND WORK

Specify as required:

Personal Protective Equipment: \_\_\_\_\_

Respiratory Protection: \_\_\_\_\_

Atmospheric Testing/Monitoring: \_\_\_\_\_

Communication: \_\_\_\_\_

Rescue Equipment: \_\_\_\_\_

Other: \_\_\_\_\_

## PREPARATION FOR ENTRY (Check after steps have been taken.)

☐ Notification of affected departments of service interruption.

☐ Isolation Methods: ☐ Lockout/tagout ☐ Blank/blind

☐ Purge/clean ☐ Inert ☐ Ventilate

☐ Atmospheric test ☐ Barriers ☐ Other: \_\_\_\_\_

☐ Personnel Awareness:

☐ Pre-entry briefing on specific hazards and control methods

☐ Notify contractors of permit and hazard conditions

☐ Other: \_\_\_\_\_

☐ Additional permits required and/or attached:

☐ Hotwork ☐ Line breaking ☐ Other: \_\_\_\_\_

## COMMUNICATION PROCEDURES

To be used by attendants and entrants:

**AUTHORIZED ENTRANT** (List by name or attach roster.)



Name of Service

Phone Number

Method of Contact

**AUTHORIZED ATTENDANTS** (List by name.)**TESTING RECORD**

Time	Acceptable Conditions	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM
Oxygen-min.	> 19.5%							
Oxygen-max.	< 23.5%							
Flammability	< 10% LEL/LFL							
H <sub>2</sub> S	< 10 ppm							
Toxic (specify)								
Cl <sub>2</sub>	< 0.5 ppm							
CO	< 35 ppm							
SO <sub>2</sub>	< 2 ppm							
Heat	°F/°C							
Other								
Tester Initials								

**AUTHORIZATION BY ENTRY SUPERVISORS**

I certify that all required precautions have been taken and necessary equipment is provided for safe entry and work in this confined space.

Printed Name

Signature

Date

Time

**THIS PERMIT MUST BE POSTED ON JOB SITE · GOOD ONLY ON INDICATED DATE**

■ List any special light sources, spark-proof tools and other electrical equipment that must be on hand before entry begins.

■ Make sure this equipment is intrinsically safe and in good condition.

■ List any measures needed to guard against shock, such as ground-fault circuit interrupters (GFCI).

■ List devices such as ladders, boatswain's chairs and work platforms. Test this equipment before entry begins.

### Permit Authorization

■ In the first blank, the entry supervisor types or prints a description of the entry.

■ After verifying that acceptable entry conditions exist, the entry supervisor signs and dates the permit.

■ **Only then** are workers allowed to enter the permit space.

### EMERGENCY AND RESCUE PROCEDURES

■ The safest ways of leaving a space when conditions deteriorate are:

- Self-rescue, when an entrant evacuates the space with no help at the first sign of trouble
- Non-entry rescue.

■ Only workers trained in rescue can enter the space for the purpose of rescue.

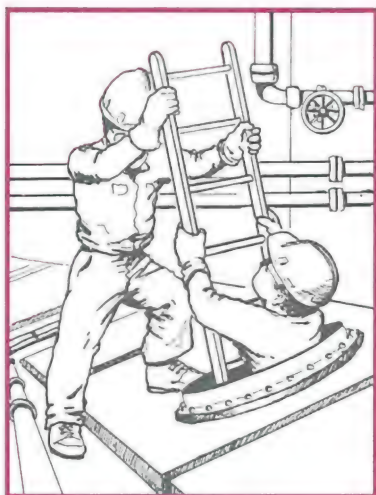
■ Notify your rescue service must be notified in advance of the entry, to ensure that they are available for an emergency. List the name and phone number of the rescue service for the attendant to use.





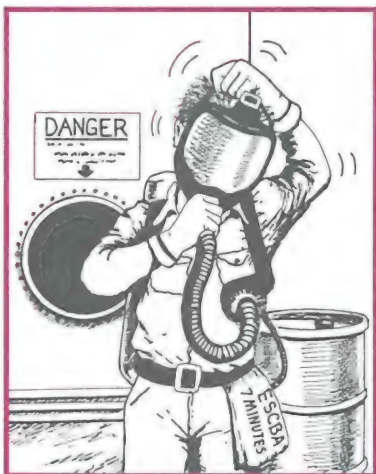
■ List necessary equipment or devices such as rescue equipment, whistles, phones and radios. Rescue equipment which may be required should be on the job site. Make sure it is in working order before entry begins.

■ It is a safe practice to ensure that all affected employees review the company's written Emergency Response Plan before entry.



■ Positive-pressure, self-contained breathing apparatus must be available on the site for rescuers if a respiratory hazard is potentially present.

■ It is a safe practice to wear an emergency escape breathing system, sometimes called an egress bottle, into a permit space whenever supplied air is required for entry. Should the supplied air fail, your emergency breathing apparatus must provide enough air to allow you to escape to breathable air.





# TRAINING AND DUTIES OF THE CONFINED SPACE ENTRY TEAM

## ENTRY SUPERVISOR

The entry supervisor makes sure conditions are safe.

■ **Before entry**, the supervisor verifies that the permit is filled out completely and all safety steps listed on it are taken, then signs the form.

- **During entry**, the entry supervisor checks conditions to make sure they stay safe throughout the work.
- If conditions become unsafe, the permit is cancelled and everyone is ordered out of the space.
- The entry supervisor sees that any unauthorized people are removed.
- When the work is finished, the entry supervisor cancels the permit and concludes the operation.

## ATTENDANT

The attendant stays at his or her post to observe conditions and support the entrant.

■ As an attendant, you must know the hazards of the permit space and the signs of exposure.

■ Keep a current count and be able to identify all entrants.

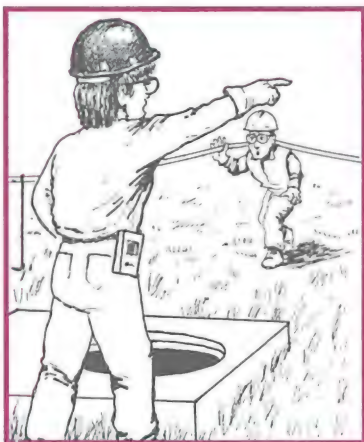
■ Stay in continuous contact with the entrants.

■ Be sure only authorized people enter the space or the area surrounding the space.

■ Order all workers out of the space in any of these situations:

- You see a condition not allowed by the entry permit.
- You notice signs of exposure in any entrant.
- You see something outside the permit space that could cause danger inside.
- You must focus your attention on the rescue of entrants from another permit space.

■ An attendant must never leave the observation post for any reason.





- If the entrants need to escape, call the rescue team at once.
- In case of emergency, **do not enter the permit space** unless you are trained in confined space rescue, have proper emergency equipment and another attendant is there to replace you.

## ENTRANT

The entrant must do his part to control the hazards of confined space entry.

As an entrant, be sure you know the hazards of the space and the signs of exposure. For example, lack of oxygen can cause:

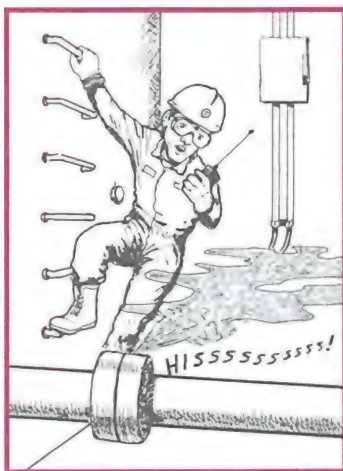
- Loss of muscle control
- Mental confusion
- Breathing difficulty
- Misguided feeling of well-being
- Ringing in the ears
- Death.

■ Follow your personal protective equipment training carefully.

■ Keep in contact with the attendant, and leave the space at once if you are ordered to evacuate.

■ Always be ready to evacuate quickly and, if possible, without help.

■ If you see that you are in danger, leave the space and tell the attendant.



# SUMMARY

Those of you working in or around confined spaces are aware of the danger. Yet, if you are familiar with pre-entry planning and with simple safety measures, most dangers can be avoided.

## PRE-ENTRY PLANNING

### Preparing for entry

- Check for completion of permit.
- Erect barriers around the space.
- Cap, blind or disconnect all input lines.
- Clear and ventilate the space of harmful vapors and residue.
- Make sure all participants understand the Emergency Action Plan.

### Verifying air quality

- Person testing or monitoring must use respiratory protection or test from outside.
- Periodic testing must be continued as long as space is occupied.
- Oxygen level must be between 19.5 and 23.5 percent.
- Flammable gasses must not be over 10 percent of LFL.
- Toxic concentrations must not be over PEL.
- Test for heat stress with **Wet Bulb Globe Thermometer**.
- All tests must be complete, accurate and documented before entry.

## SAFETY MEASURES

### Equipment

- All personal protective equipment and emergency escape breathing systems must be available on site.

### Emergency situation

- Emergency services must be notified well in advance of time, date and place of entrance.
- The attendant may enter only if trained in rescue and if a second attendant is present.

Safe confined space entry takes teamwork between the entrant, the attendant and the entry supervisor. Everyone must do their part, so that any worker who goes into a permit-required confined space will come out of it in good health.



## QUIZ

1. True False One feature of permit-required confined spaces is that they have small or obstructed ways of getting in and out.
2. True False The only serious hazard of permit spaces is that the air might not have enough oxygen.
3. True False Hazards in permit spaces are more serious because it can be difficult for rescuers to reach workers who need help.
4. True False The employer identifies all permit spaces in the workplace and their hazards.
5. True False If conditions are safe before anyone enters a permit space, they will stay safe throughout the work.
6. True False After workers enter a permit space, the entry supervisor verifies and signs the permit.
7. True False Whenever the air in a permit space may be oxygen-deficient or toxic, it is a good idea to wear an emergency escape breathing system to back up supplied air.
8. True False Before anyone enters a permit space, it is necessary to make sure no hazardous energy or material will be released into the space.
9. True False Permit spaces must sometimes be cleaned before entry to get rid of hazardous materials.
10. True False If ventilation is needed, it should be started just before the space is entered.
11. True False The air must be tested in only one part of the permit space, since it will be the same in all areas of the space.
12. True False The three basic atmospheric tests check the air's oxygen level, flammability, and toxicity.

13. True False A permit space can be entered if two of the three atmospheric tests show the air is safe.
14. True False Special equipment is sometimes needed in permit spaces to guard against falls and electric shocks.
15. True False When respiratory protection is needed, any type of respirator can be used.
16. True False In some cases, permit space entrants and attendant need radio or video equipment to stay in contact with each other.
17. True False Rescue equipment should be tested before entry begins.
18. True False One duty of the entry supervisor is to make sure conditions stay safe after the permit space has been entered.
19. True False If the attendant sees a dangerous condition, he must ask the entry supervisor to order the entrants to leave the permit space.
20. True False In an emergency, the entrant should wait inside the permit space for help to arrive.

### ACKNOWLEDGEMENT OF TRAINING

I have read and understand the training handbook, **Confined Space Entry**. I have also completed and passed the comprehensive quiz at the conclusion of this handbook.

---

Employee's Signature

Date

---

Trainer's Name

Date

**NOTE:** This record may be included in the employee's personnel or training file.

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- Hand Safety
- Hazard Communication
- HAZWOPER Training Series
- Hearing Protection
- Heat Stress
- Indoor Cranes
- Lab Safety
- Lockout/Tagout Series
- Low-Lift Trucks
- Motor Vehicle Awareness
- Office Safety
- Personal Protective Equipment
- Pollution Prevention Series
- Respiratory Protection
- Static Electricity
- Trenching & Shoring
- Video Display Terminals



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PERMIT REQUIRED!



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